

Application Number: 10/821,769
Amendment Dated: August 14, 2006
Reply to Office Action Dated: February 13, 2006

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REMARKS

This amendment is responsive to the Office Action dated February 13, 2006, for which a three (3) month period of response was given. A Petition and fee for a three (3) month extension of time accompanies this Response. Since August 13, 2006 was a Sunday, this paper and any accompanying papers are timely filed on Monday, August 14, 2006. The Commissioner is hereby authorized to charge all necessary fees, including the fee associated with the extension of time request, to Deposit Account No. 50-0959, Docket Number 089498.0354.

Claims 1, 2, 4, 5 and 7 through 20 are pending in the present application upon entry of the above amended claims. Claims 3, 6 and 21 through 30 have been, or were previously, cancelled. Claims 1 and 12 have been amended to more clearly state the nature of the present invention. Support for the amendments to claims 1 and 12 exists in the specification and Figures as filed. Accordingly, entry and consideration of the amendments to the claims, and the remarks which follow, is believed due and is respectfully requested.

I. The 35 U.S.C. § 112, First Paragraph, Rejection:

Claims 1, 2, 4, 5 and 7 through 20 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Specifically, the Examiner contends that claims 1, 2, 4, 5 and 7 through 20 contain subject matter that is not described in the specification in a manner sufficient to convey to one of ordinary skill in the art that the inventors, at the time of the invention, had possession of the claimed invention.

In response to the above rejection, claims 1 and 12 have been amended to specify that the combination of the resin outer layer and the core has a constant thickness and cross-sectional shape, and is generally uniform and free of any surface irregularities. This feature is clearly supported by both the text of the specification as filed, and further by at least Figures 2 and 3, as filed.

Given the amendments made to claims 1 and 12, it is believed that the 35 U.S.C. § 112, first paragraph, rejections of claims 1, 2, 4, 5 and 7 through 20 have been rendered moot, and withdrawal thereof is believed to be warranted and is respectfully requested.

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II. The 35 U.S.C. § 102(b) Rejections:

Claims 1, 2, 4, 5 and 9 through 20 have been rejected under 35 U.S.C. § 102(b) over Fish (U.S. Patent No. 6,454,251); claims 1, 2, 4, 5 and 8 through 20 have been rejected under 35 U.S.C. § 102(b) over Reinhart et al. (U.S. Patent No. 2,852,424); claims 1, 2, 4, 5 and 9 through 20 have been rejected under 35 U.S.C. § 102(b) over Hashimoto (U.S. Patent No. 4,473,217); and claims 1, 2, 4, 5 and 10 through 20 have been rejected under 35 U.S.C. § 102(b) over Taylor (U.S. Patent No. 4,991,827).

As noted above, independent claims 1 and 12 have been amended. Amended claims 1 and 12 are now directed to fiber-reinforced composite springs that include a spring wire, the spring wire comprising a core that includes a plurality of fiber tows, and an outer layer of resin that is substantially devoid of the fiber tows, wherein the combination of the resin outer layer and the core has a constant thickness and cross-sectional shape, and is generally uniform and free of any surface irregularities, thereby yielding a spring that has a predictable rate of deformation when subjected to a compressive load (emphasis added).

Turning to the art of record, Fish, U.S. Patent No. 6,454,251, is directed to a composite core assembly used to fabricate high performance structures, such as springs. In one form, the core assembly is composed of an inner composition of structurally fibrous material and an external cladding. Resin is impregnated into the fibrous material, and the external cladding functions as a containment device for liquid resin material during the fabrication of structural parts. As can be seen From Figure 2C, the core assembly of Fish does not contain, nor does it teach or suggest, a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. Accordingly, Fish fails to disclose, teach or suggest the springs of pending claims 1 and 12.

Reinhart et al., U.S. Patent No. 2,852,424, is directed to reinforced plastic springs made by subjecting a circular-shaped tube 12, containing a homogenous mixture of glass rovings 14 and liquid resin 10, to twisting about a mandrel. After curing of the resin/glass roving mixture, tube 12 is removed. As can be seen from Figure 3 of Reinhart et al., tube 12 contains a homogeneous mixture of glass rovings 14 and liquid resin 10. The

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homogeneous nature of the spring of Reinhart et al. is confirmed by the passage at column 3, lines 64 to 68. Given the disclosure contained therein, Reinhart et al. fails to disclose, teach or suggest a spring comprising, in part, a core that includes a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. As such, Reinhart et al. fails to disclose, teach or suggest a spring that includes a core as specified in pending claims 1 and 12.

Hashimoto, U.S. Patent No. 4,473,217, is directed toward a fiber-reinforced resin coil spring and method of manufacturing such a spring. The Hashimoto spring is formed by a spring wire comprising a plurality of bundled glass fibers that are impregnated with a thermosetting resin. Once impregnated, the bundled glass fibers are subjected to a tensile force and twisted about a longitudinal axis to form a resin-immersed and twisted rod-shaped fiber bundle. As is specified at column 2, lines 61 to 65, Hashimoto notes that the resin impregnated within the fiber bundle is slightly squeezed out by the twisting step, and as a result, the content of the fiber in the rod-shaped fiber bundle is increased.

Given the disclosure contained therein, Hashimoto fails to disclose, teach or suggest a spring comprising, in part, a core that includes a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. As such, Hashimoto fails to disclose, teach or suggest a spring that includes a core as specified in pending claims 1 and 12.

Taylor, U.S. Patent No. 4,991,827, discloses a spring formed from a rope that has been pressure-saturated with a binder. The rope comprises a plurality of twisted strands, each containing a plurality of monofilaments. The strands are combined with a binder such that the rope is saturated with the binder under pressure to cause the binder to enter all of the spaces between the monofilaments and form an irregular outer layer on the outer periphery of the rope (emphasis added – see column 3, lines 52 to 63 and Figure 3). After the rope has been saturated, it is permitted to drain to remove the excess binder. Thereafter the drained rope and binder combination is pulled through a tubular sheath,

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causing the rope to retain its saturated condition and shape. Thereafter, the rope binder combination is wound about a suitable mandrel and cured to yield a spring.

In view of the above, Taylor fails to disclose, teach or suggest a spring comprising, in part, a core that includes a resin outer layer that is: (i) substantially devoid of the fiber tows; (ii) has a constant thickness and cross-sectional shape, and (iii) is generally uniform and free of any surface irregularities. As such, Taylor fails to disclose, teach or suggest a spring that includes a core as specified in pending claims 1 and 12.

Furthermore, it is important to note that a fiber-reinforced composite spring containing a resin outer layer core combination as recited in pending claims 1 and 12 possesses advantages over the springs disclosed in the prior art of record. For example, when springs in accordance with the present invention are placed under stress, the applied load on such springs is generally constant along a longitudinal axis of the spring wire. That is, springs in accordance with the present invention generally have no weak points or defects within their cores.

Accordingly, since none of Fish, Reinhart et al., Hashimoto, and/or Taylor disclose a spring that contains a resin outer layer/core combination as recited in pending claims 1 and 12, the cited art cannot anticipate any combination of claims 1, 2, 4, 5 and 8 through 20, and withdrawal of the pending anticipation rejections is respectfully requested.

III. The 35 U.S.C. § 103(a) Rejections:

Claim 7 has been rejected multiple times under 35 U.S.C. § 103(a) over: (i) Fish (U.S. Patent No. 6,454,251) in view of Petrina (U.S. Patent No. 6,612,556); (ii) Taylor (U.S. Patent No. 4,991,827) in view of Petrina (U.S. Patent No. 6,612,556); (iii) Hashimoto (U.S. Patent No. 4,473,217) in view of Petrina (U.S. Patent No. 6,612,556); and (iv) Reinhart et al. (U.S. Patent No. 2,852,424) in view of Petrina (U.S. Patent No. 6,612,556).

Petrina discloses a single spring unit which includes a multi-helical spring formed of composite materials. While Petrina teaches that the wire can be rectangular in cross section, Petrina does not disclose, teach or suggest a spring containing, in part, a core as specified in pending claim 1. Additionally, Petrina does not disclose, teach or suggest a spring containing a resin outer layer/core combination, as specified in pending claim 1.

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Since Petrina fails to disclose, teach or suggest, at a minimum, the claimed combination of a resin outer layer and core as specified in claim 1, Petrina fails to cure the deficiencies of Fish; Taylor, Hashimoto, and Reinhart et al.

In view of the above, the obviousness rejections of claim 7 are unfounded and withdrawal thereof is respectfully requested.


IV. Conclusion:

For at least the foregoing reasons, the rejections under 35 U.S.C. §§ 102(b), 103(a), and 112, first paragraph, are believed to be unfounded.

For at least the foregoing reasons, the present application is believed to be in condition for allowance, and a Notice of Allowance is respectfully requested.

Should the Examiner wish to discuss any of the foregoing in more detail, the undersigned attorney would welcome a telephone call.

Respectfully submitted,



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August 14, 2006

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